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# POWER SUPPLY

MODELS SM 36-15X
OR SM 36-15MX

SERIAL NO. 3.2906

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# INSTRUCTION MANUAL

kepco inc.®

131-38 SANFORD AVENUE • FLUSHING 52, N. Y.
Area Code 212 IN 1-7000 • TWX # NY 4-5196

INSTRUCTION MANUAL

MODELS SM 36-15X
OR SM 36-15MX

SERIAL NO. 3.29.0.6

KEPCO, INC.
131 - 38 Sanford Avenue
Flushing 52, New York

Kepco, Inc.
Flushing, New York

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## SECTION A SPECIFICATIONS AND CONTROLS FOR MODELS SM 36-15X AND SM 36-15MX

### I. ELECTRICAL AND PHYSICAL SPECIFICATIONS:

.....DC OUTPUT VOLTAGE:
0-36 volts DC, continuously variable.

.....DC OUTPUT CURRENT:
0-15 amperes, continuous duty.

.....AC INPUT:
105-125 volts, 60± 1/2 cps, 10.5 amperes (max.), 1100 watts (max.).

.....REGULATION: (See "remote error sensing" under "II. Terminals and Controls.")
Line: Less than 0.01% for 105-125 volts AC line fluctuations at any output voltage in the specified range.
Load: Less than 0.01% or 0.001 volt, whichever is greater, for 0-15 ampere step load change, at any output voltage in the specified range.

.....RIPPLE:
Less than 0.001 volts rms.

.....STABILITY:
Output voltage variation is less than 0.01%. Over a period of 8 hours, after unit has reached equilibrium. Approximately 3/4 of an hour is required for this unit to reach equilibrium from a "cold start".

.....OUTPUT IMPEDANCE:
Less than .001 ohm from DC to 1 KC.
Less than .03 ohm from 1 KC to 100 KC.

.....RECOVERY TIME:
50 microseconds.
Recovery time is defined as the time required for the output voltage to return to within 0.1 volts of the output voltage setting.

.....TEMPERATURE COEFFICIENT:
Output voltage changes less than 0.01% per °C.

.....AMBIENT OPERATING TEMPERATURE:
-20°C to +50°C maximum. Protective circuit turns off unit whenever over-temperature condition occurs in pass elements. Interrupting input power resets unit.

.....STORAGE TEMPERATURE:
-40°C to +85°C.

.....DIMENSIONS:
8-3/4" high x 19" wide x 13-7/8" deep (behind panel).

.....COLOR:
Kepco Standard Gray Hammertone.

..... METERS: (APPLIES ONLY TO MODEL SM 36-15MX)
Voltmeter: 0-50 volts, 2-1/2".
Ammeter: 0-15 amps, 2-1/2".

## II. TERMINALS AND CONTROLS:

.....(On front panel):

....DC OUTPUT AND GROUND binding posts, clearly marked. Output terminals isolated from chassis; either positive or negative terminal may be grounded.
....VOLTAGE CONTROL, continuously variable, for setting the desired output voltage.
....POWER ON-OFF switch.

.....(At rear of unit):
....DC OUTPUT AND GROUND binding posts, clearly marked; either positive or negative terminal may be grounded.
....REMOTE ERROR SENSING binding posts provide means of maintaining specified regulation directly at the load by compensating for voltage drop across load supply leads for up to 0.5 volt maximum per lead. (See Diagram and Procedure on Page C-1.)

## III. PROTECTIVE FEATURES:

....REFERENCE FUSE for input to the auxiliary supplies. Pilot light goes out if fuse blows; fan stops.
....POWER FUSE for line power input. Pilot light goes out if fuse blows; fan stops.
....DC FUSE for main supply. Pilot light remains on if fuse blows; fan remains operative.

.....OVERLOAD PROTECTION:
Provided by inherent current limiting action of FLUX-O-TRAN. Output may be shorted momentarily without damage to unit. Continuous overload or short will blow DC FUSE.

.....OVER-TEMPERATURE PROTECTION:
Thermostat relay control turns unit off if temperature of pass elements exceeds safe limit. Relay is reset by interrupting input power with ON-OFF switch on front panel, or by disconnecting line cord from power source.

SECTION B

BRIEF THEORY:

Two circuit schematic drawings titled "POWER UNIT" and "CONTROL UNIT" are included in the Reference Index of this instruction manual. These drawings contain designations corresponding to the capitalized terms in the following discussion.

Some basic functional relationships in this power supply are illustrated in block Diagram B-1 (Page B-2A).

The POWER UNIT includes:

DC SOURCES:

.... MAIN SUPPLY - (consisting of a Kepco "Flux-O-Tran" transformer, full wave bridge rectifier, and capacitive filter) provides line regulated DC power for the output, via the PASS CIRCUITRY.

.... AUXILIARY SUPPLIES: COLLECTOR SUPPLY (negative full wave rectified) for PASS CIRCUITRY driver stages not connected to MAIN SUPPLY; $I_{CO}$ SUPPLY (full wave rectified) compensates for spurious biasing effects of collector leakage current; RETURN SUPPLY (full wave rectified) acts as leakage current path for series pass transistors and as bleed path to provide minimum operating current for pass transistors; CONTROL UNIT SUPPLY (full wave rectified).

PASS CIRCUITRY:

The power transistors which function as pass elements (i.e. are in series with the load) may be regarded effectively as variable resistors (or conductors) controlled by a CONTROL SIGNAL. The current "passed" by these elements is a function of the emitter-base bias. The CONTROL SIGNAL is applied to the base terminal; hence a negative CONTROL SIGNAL will aid the forward conduction of a PNP transistor while a positive CONTROL SIGNAL will reduce the forward conduction. In response to the CONTROL SIGNAL the pass elements effect a current and voltage distribution in the main DC loop which holds the output voltage constant.

The CONTROL UNIT includes:

REFERENCE CIRCUITRY:

The function of the REFERENCE CIRCUITRY is to maintain a precise, stable, voltage standard for the COMPARISON AMPLIFIER.

COMPARISON AMPLIFIER:

The COMPARISON AMPLIFIER is essentially a series of cascaded transistor amplifiers which boost the differential error signal produced in the COMPARISON BRIDGE to a level sufficient to drive the PASS CIRCUITRY. The COMPARISON AMPLIFIER is connected across the COMPARISON BRIDGE from the junction of the VOLTAGE CONTROL and the REFERENCE RESISTANCE to the junction of the REFERENCE DIODE and the negative output terminal (See Diagram on Page B-2A). This arrangement is similar to that of a null galvanometer across a Wheatstone bridge. Unbalance in the COMPARISON BRIDGE is amplified to produce a CONTROL SIGNAL of suitable magnitude and phase to effect corrective action by the PASS CIRCUITRY.

COMPARISON BRIDGE: (See Diagram B-2, Page B-2A).

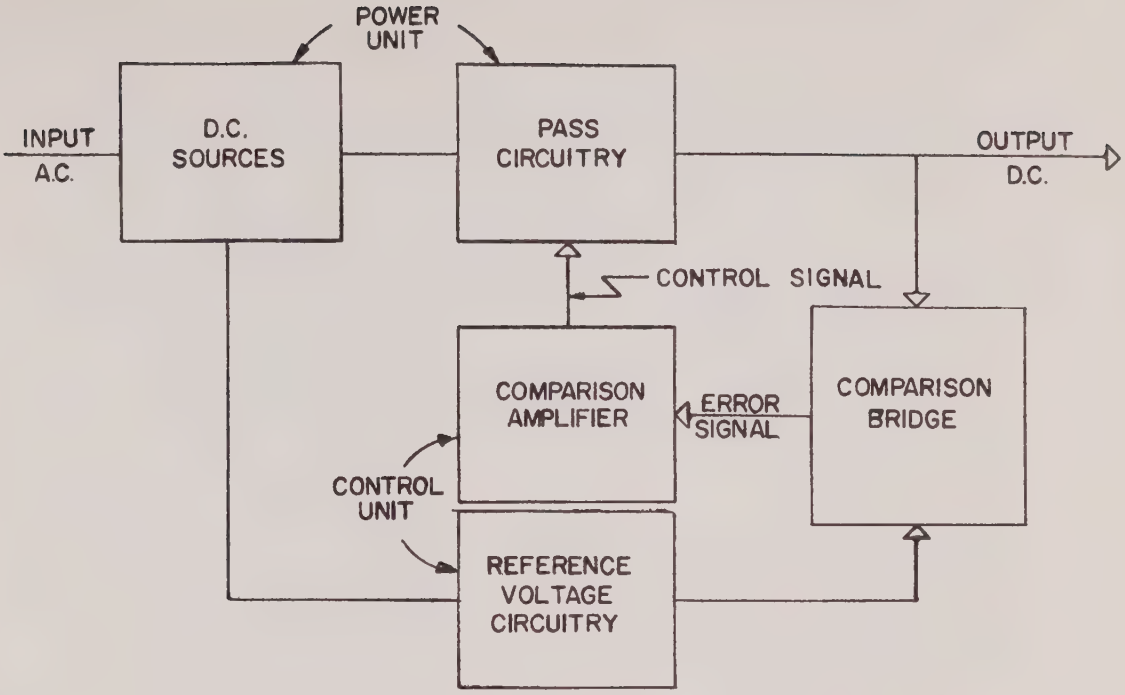
This bridge circuit implements the comparison between the OUTPUT VOLTAGE and the REFERENCE VOLTAGE. The signal produced by the comparison drives the COMPARISON AMPLIFIER.

Balance occurs in the Comparison Bridge when the following ratios are equal:

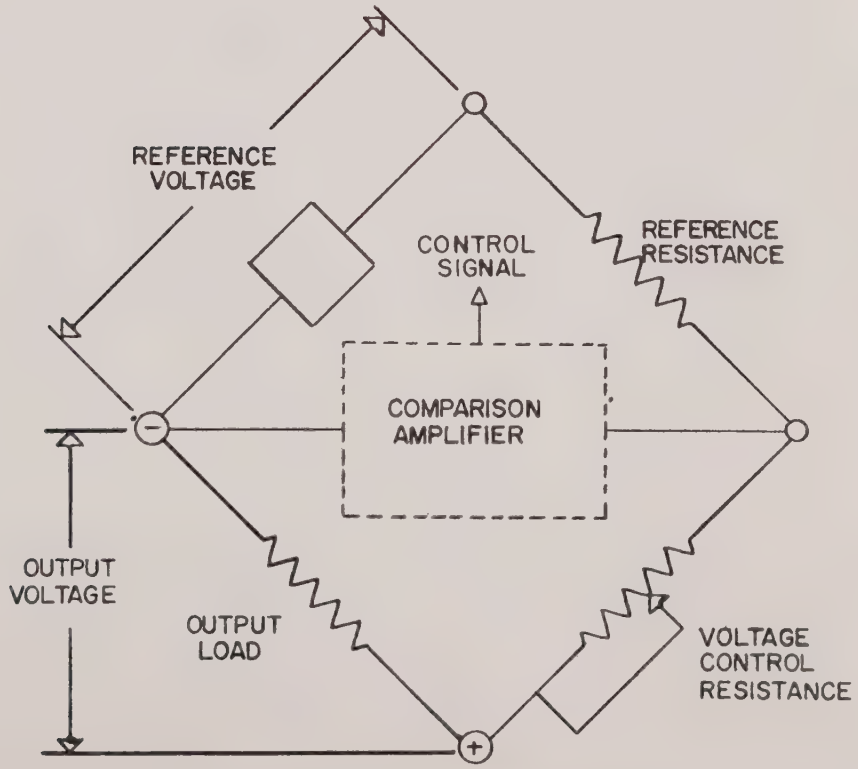
$$\frac{\text{Output Voltage}}{\text{Voltage Control Resistance}} = \frac{\text{Reference Voltage}}{\text{Reference Resistance}}$$

When, for example, the Comparison Bridge is unbalance by a decreasing output voltage drop across the load, it gives rise to a negative signal at the base of the COMPARISON FOLLOWER in the COMPARISON AMPLIFIER circuit. This signal is amplified in cascade and communicated to the pass elements as a negative base input aiding their forward conduction and consequently increasing the output voltage.

A bridge unbalance caused by an increasing output voltage produces, of course, a chain of oppositely biased circuit responses which reduce the voltage across the load.




(DIAGRAM B-1) *VOLTAGE REGULATED POWER SUPPLY*




(DIAGRAM B-2) *COMPARISON BRIDGE*

This power supply is shipped without any internal packing material; and may be put into operation immediately. It is designed for rack and for bench use. Carrying handles are provided on front panel.

....INTIAL "TURN - ON" PROCEDURE:

1. Adjust VOLTAGE CONTROL to approximate mid-range position.
2. With POWER ON-OFF switch set in "OFF" position, connect line cord to 115 v ac, 60 cps input power. If outlet is not polarized use 3 to 2 - prong adapter supplied with unit.
3. Set POWER ON-OFF switch to "ON" position.
4. Adjust VOLTAGE CONTROL to obtain desired output voltage.

....GENERAL OPERATION:

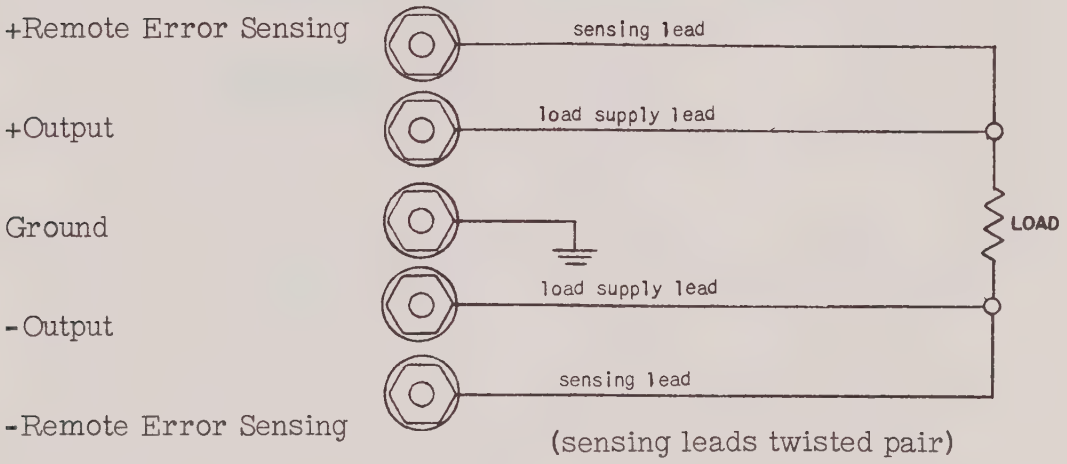
1. Once it has been determined that the unit is functioning satisfactorily, it is subsequently unnecessary to follow the INITIAL TURN-ON PROCEDURE.
2. The VOLTAGE CONTROL may be left fixed at any setting and the power turned "ON" and "OFF" without any harmful effects.

....MAINTENANCE AND REPAIR:

1. Under normal operating conditions, no mechanical maintenance of any kind should be required. Conservatively rated electrical components assure long trouble-free operating life.
2. Exceptional component accessibility, provided by resistor board construction and plug-in sub-assemblies, facilitates servicing, should it be required. It is emphatically recommended that trouble-shooting be handled by personnel highly familiar with transistor circuitry, - preferably with experience in closed-loop designs.
3. This unit should not be returned to the manufacturer without proper authorization and shipping instructions. In any correspondence with the factory regarding repair, the model, serial number, and symptoms of malfunction must be included.

## REMOTE ERROR SENSING OPERATION

(Terminal Connections)




(sensing leads twisted pair)

(Procedure)

1. With AC input power disconnected, remove jumpers between plus and minus Output terminals and Remote Error Sensing terminals on the rear of the unit.

2. Using twisted pair wire, connect sensing leads from positive and negative Remote Error Sensing terminals to the load (observing polarities).

3. Using twisted pair wire, connect load supply leads from positive and negative Output terminals.

IMPORTANT NOTE: This unit should not be operated with Remote Error Sensing if the voltage drop across the load supply leads exceeds 0.5 volt (maximum) per lead at maximum rated output current.

| Schematic Part No. | Kepco Part No. | Description | Specifications | Mfr. | Mfr's. No. |
|---|---|---|---|---|---|
| B201 | 149-0013 | Fan, Venturi | | Rotron | Muffin Fan |
| | | Capacitors: | | | |
| C201 | 117-0294 | Electrolytic, Can Type | 21 K µf 57.5 v +100, -10% | Sangamo | DCM |
| C202, 203 | 117-0242 | Electrolytic, Can Type | 10.5 K µf 65 v +100, -10% | Industrial Cond. | 1B1211 |
| C204 | 117-0280 | Paper, Can Type | 8 µf 660 v AC 6% | Industrial Cond. | 2465-SVR |
| C206 | 117-0129 | Mylar | 2 µf 200 v 10% | Hopkins Eng. | 1P2MK |
| C207 | 117-0068 | Mylar | 0.1 µf 600 v 20% | Good-All | 620S10406W |
| C301 | 117-0163 | Ceramic | 0.05 µf 500 v 20% | Sprague | 36C142A1 |
| C302 | 117-0147 | Electrolytic, Pigtail Type | 10 µf 150 v + 50, -10% | Industrial Cond. | 10B912RM |
| C303 | 117-0114 | Electrolytic, Pigtail Type | 350 µf 50 v + 50, -10% | Industrial Cond. | 50RM350 |
| C401 | 117-0114 | Electrolytic, Pigtail Type | 350 µf 50 v +100, -10% | Industrial Cond. | 1B844 |
| C402 | 117-0222 | Electrolytic, Pigtail Type | 100 µf 200 v + 50, -10% | Industrial Cond. | 20B317RM |
| C403, 404 | 117-0221 | Electrolytic, Pigtail Type | 500 µf 50 v +100, -10% | Industrial Cond. | 1B1163RM |
| C405, 406 | 117-0163 | Ceramic | 0.05 µf 500 v 20% | Sprague | 36C142A1 |
| | | Rectifiers: | | | |
| CR201 | 124-0132 | Silicon, Stack Type | | Kepco | 124-0132 |
| CR301, 302 | 124-0028 | Silicon, Pigtail Type | | Automatic Mfg. | PT-5 |
| CR401, 402 405, 408 | 124-0084 | Silicon, Pigtail Type | | Transitron | SL-91 |
| CR403, 404 | 124-0028 | Silicon, Pigtail Type | | Automatic Mfg. | PT-5 |

| Schematic Part No. | Kepco Part No. | Description | Specifications | Mfr. | Mfr's. No. |
|---|---|---|---|---|---|
| F101 | 141-0010 | Fuse, Instantaneous | 15 a 250 v | Bussmann | ABC-15 |
| F102 | 141-0038 | Fuse, Slow Blow | 20 a 32 v | Bussmann | MDL-20 |
| F401 | 141-0012 | Fuse, Instantaneous | 2 a 250 v | Bussmann | AGC-2 |
| M101 | 135-0138 | Meter | 50 v DC 2-1/2" | Gen. Elec. | 8DW91V201AR2 |
| M102 | 135-0141 | Meter | 15 a DC 2-1/2" | Gen. Elec. | 8DW91A230BX2 |
| | | (Meters apply only to Models SM 36-15M, SM 36-15MX) | | | |
| PL101 | 153-0024 | Pilot Light | | Gen. Elec. | NE-51 |
| Q301 | 119-0022 | Transistor, PNP | | Tung-Sol | 2N382 |
| Q302 | 119-0034 | Transistor, PNP | | Delco | 2N1172 |
| | | Resistors: | | | |
| R201 | 115-0513 | Fixed, Power, Strip | 1 K Ω 40 w 5% | Ward Leonard | 40S1000 |
| R202 | 115-0690 | Fixed, Power, Strip | 1 Ω 20 w 5% | Ward Leonard | 20S1WL |
| R203 | 115-0909 | Fixed, Power, Strip | 5 Ω 30 w 5% | Ward Leonard | 30S5 |
| R204 | 115-0551 | Fixed, Power, Strip | 500 Ω 20 w 5% | Ward Leonard | 20S500WL |
| R205 | 115-0577 | Fixed, Power, Strip | 150 Ω 20 w 5% | Ward Leonard | 20S150WL |
| R206-208 | 115-1014 | Fixed, Power, Ribbon | 0.1 Ω 40 w 5% | Hardwick Hindle | HH2B-35-0.1Ω-5% |
| R209 | 115-0896 | Variable, Wire Wound | 5 K Ω 2.5 w 5% | Gen. Radio | 973-M |
| R210, 211 | 115-0718 | Fixed, Molded | 47 Ω 1/2 w 10% | Allen-Bradley | EB4701 |
| R212 | 115-0681 | Fixed, Molded | 33 Ω 1/2 w 10% | Allen-Bradley | EB3301 |
| R213 | 115-0502 | Fixed, Molded | 10 Ω 1/2 w 10% | Allen-Bradley | EB1001 |
| R301 | 115-0421 | Fixed, Power, Axial | 10 Ω 3 w 5% | Ward Leonard | 3X10WL |
| R302 | 115-0904 | Fixed, Molded | 68 Ω 1/2 w 5% | Allen-Bradley | EB6805 |

| Schematic Part No. | Kepco Part No. | Description | Specifications | Mfr. | Mfr's. No. |
|---|---|---|---|---|---|
| | | Resistors: | | | |
| R303 | 115-0808 | Fixed, Molded | 3.9 K ohms 1/2 w 5% | Allen-Bradley | EB3925 |
| R304 | 115-0900 | Fixed, Molded | 1.2 K ohms 1 w 5% | Allen-Bradley | GB1225 |
| R305 | 115-0905 | Fixed, Power, Axial | 200 ohms 5 w 5% | Ward Leonard | 5X200 |
| R306 | 115-0341 | Fixed, Molded | 100 ohms 1/2 w 5% | Allen-Bradley | EB5605 |
| R307 | 115-0250 | Fixed, Molded | 330 K ohms 1/2 w 5% | Allen-Bradley | EB3345 |
| R308 | 115-0512 | Fixed, Power, Axial | 1 K ohms 5 w 5% | Ward Leonard | 5X1000WL |
| R309 | 115-0809 | Fixed, Molded | 100 K 1/2 w 10% | Allen-Bradley | EB1041 |
| RL201 | 140-0040 | Relay, Plug-In Type | | Kurman | 26D3C |
| S101 | 127-0107 | Switch, Toggle | SPST | Carling | AA252-71-2 |
| T201 | 100-1180 | Transformer, Flux-O-Tran | | Kepco Magnetics | 100-1180 |
| T202 | 175-0419 | Transformer, Variable | | Superior | Q116-1027 |
| T401 | 100-1179 | Transformer | | Kepco Magnetics | 100-1179 |
| A0/441-10 | 110-0114 | PASS ASSEMBLY (STAT) Includes the following: | | | |
| 1 ea. | 119-0016 | Transistor, PNP | | Delco | 2N441-10 |
| 2C0.2/SP67 | 110-0118 | PASS ASSEMBLY (STAT) Includes the following: | | | |
| 2 ea. | 115-0891 | Resistor, Fixed, Power, Axial | 0.2 ohms 5 w 5% | Ward Leonard | 7/8"-Y-O.2-Axiohm-5% |
| 2 ea. | 119-0035 | Transistor, PNP | | Motorola | SP67* |

*Field Replacement: Motorola 2N1163

| Schematic Part No. | Kepco Part No. | Description | Specifications | Mfr. | Mfr's. No. |
|---|---|---|---|---|---|
| 2C0.2TC/SP67 | 110-0120 | PASS ASSEMBLY (STAT) | | | |
| | | Includes the following: | | | |
| 2 ea. | 115-0891 | Resistor, Fixed, Power, Axial | 0.2 ohms 5 w 5% | Ward Leonard | 7/8"-Y-0.2-Axiohm-5% |
| 1 ea. | 127-0093 | Switch, Thermostat | N.C. | Chatham | DRSCORP73C |
| 2 ea. | 119-0035 | Transistor, PNP | | Motorola | SP67* |

*Field Replacement: Motorola 2N1163

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# REPLACEMENT PARTS LIST

Control Unit, Model TRAM 31 — Code 4-2062 — 

| SCHEMATIC NO. | QTY. | DESCRIPTION | MFRS. NAME & PART NO. (See Note) | KEPCO PART NO. |
|---|---|---|---|---|
| C1 | 1 | Capacitor, Electrolytic<br>10 µf, 50v; Pigtail | Industrial<br>05RM10 | 117-0136 |
| C2 | 1 | Capacitor, Mylar<br>2 µf, 200v | Hopkins<br>2P2M | 117-0129 |
| C3 | 1 | Capacitor, Mylar<br>0.5 µf, 200v | Hopkins | 117-0123 |
| CR1,2 | 2 | Rectifier, Silicon, Pigtail<br>500 ma, 100 PIV | Transitron<br>SL-91 | 124-0084 |
| L1 | 1 | Choke, RF<br>550 microhenry | Miller<br>4649 | 176-0046 |
| Q1 | 1 | Transistor, PNP<br>Equal to 2N1172 | Delco<br>119-0034 | 119-0034 |
| Q2-6;<br>8,10 | 7 | Transistor, PNP<br>Equal to 2N382 | Tung-Sol<br>119-0022 | 119-0022 |
| Q7,9 | 2 | Transistor,NPN | General Transistor<br>119-0007 | 119-0007 |
| R1,5 | 2 | Resistor, Fixed, Molded<br>3.3 K ohms, 1/2w; 5% | Allen Bradley<br>EB3325 | 115-0452 |
| R2, 14 | 2 | Resistor, Fixed, Molded<br>2.7 K ohms, 1/2w; 10% | Allen Bradley<br>EB2721 | 115-0560 |
| R3,4 | 2 | Resistor, Fixed, Precision<br>500 ohms, 1w; 1% | Sage Electronics<br>SAIW | 115-1192 |
| R6,7 | 2 | Resistor, Fixed, Molded<br>6.8 K ohms, 1/2w; 5% | Allen Bradley<br>EB6825 | 115-0579 |
| R8 | 1 | Resistor, Fixed, Precision<br>15K, 1/2w; 1% | Dale<br>WS 1/2 | 115-0646 |
| R9 | 1 | Resistor, Power, Axial, WW<br>10 K ohm, 3w; 5%,LTC | Hardwick Hindle<br>9/16 GA | 115-1162 |
| R10 | 1 | Resistor, Power, Axial<br>2.5 K ohms, 3w; 5%, WW | Ward Leonard<br>3X2500 | 115-0469 |
| R11 | 1 | Resistor, Fixed, Precision<br>400 ohms, 1w; 1% | Sage Electronics<br>SAIW | 115-1191 |

REPLACEMENT PARTS MAY BE ORDERED FROM KEPCO, INC. ORDERS SHOULD INCLUDE KEPCO PART NUMBER AND DESCRIPTION.

PLEASE NOTE: THE MANUFACTURER'S NAME AND PART NUMBER LISTED FOR EACH ITEM ON REPLACEMENT PARTS LISTS, REPRESENTS AT LEAST ONE SOURCE FOR THAT ITEM AND IS LISTED SOLELY FOR THE CONVENIENCE OF KEPCO EQUIPMENT OWNERS IN OBTAINING REPLACEMENT PARTS LOCALLY. WE RESERVE THE RIGHT TO USE EQUIVALENT ITEMS FROM ALTERNATE SOURCES. KEPCO, INC.

| SCHEMATIC NO. | QTY. | DESCRIPTION | MFRS. NAME & PART NO. (See Note) | KEPCO PART NO. |
|---|---|---|---|---|
| R12 *Note 1 | * | Resistor, Fixed, Precision 800 ohms, 1/2w; 1% | Sage Electronics 1050S | 115-1193 |
| R12 *Note 2 | * | Resistor, Fixed, Precision 700 ohms, 1/2w; 1% | Sage Electronics 1050S | 115-1194 |
| R12 *Note 3 | * | Resistor, Fixed, Precision 900 ohms, 1/2w; 1% | Sage Electronics 1050S | 115-1195 |
| R13 | 1 | Resistor, Power, Axial 500 ohms, 3w; 5%, LTC | Ward Leonard 3X500 LTC | 115-0938 |
| R15 | 1 | Resistor, Fixed, Molded 20 ohms, 1/2w; 5% | Allen Bradley EB2005 | 115-0508 |
| R16 | 1 | Resistor, Fixed, Molded 160 K ohms, 1/2w; 5% | Allen Bradley EB1645 | 115-1024 |
| R17 | 1 | Resistor, Fixed, Molded 10 K ohm, 1/2w; 5% | Allen Bradley EB1035 | 115-0249 |
| R18 | 1 | Resistor, Fixed, Molded 300 ohms, 1/2w; 5% | Allen Bradley EB3015 | 115-0783 |
| R19 | 1 | Resistor, Power, Axial, WW 250 ohms, 3w; 5%, LTC | Hardwick Hindle 9/16 GA | 115-1161 |
| R20,24 | 2 | Resistor, Power, Axial, WW 10 ohms, 3w; 5%, LTC | Hardwick Hindle 9/16 GA | 115-1160 |
| R21 | 1 | Resistor, Fixed, Molded 100 ohms, 1w; 5% | Allen Bradley GB1015 | 115-0902 |
| R22 | 1 | Resistor, Variable, Multiturn 200 ohms, 1/4 w; 10%,25 t | Bourns Labs Trimit 271-1-201 | 115-0863 |
| R23 | 1 | Resistor, Fixed, Molded 180 ohms, 1/2w; 5% | Allen Bradley EB1815 | 115-0807 |
| R25 | 1 | Resistor, Fixed, Molded 10 ohms, 1/2w; 10% | Allen Bradley EB1001 | 115-0818 |
| RD1 | 1 | Reference Diode Zener, 6.2v, 10 ma | Hoffman IN429 | 121-0001 |

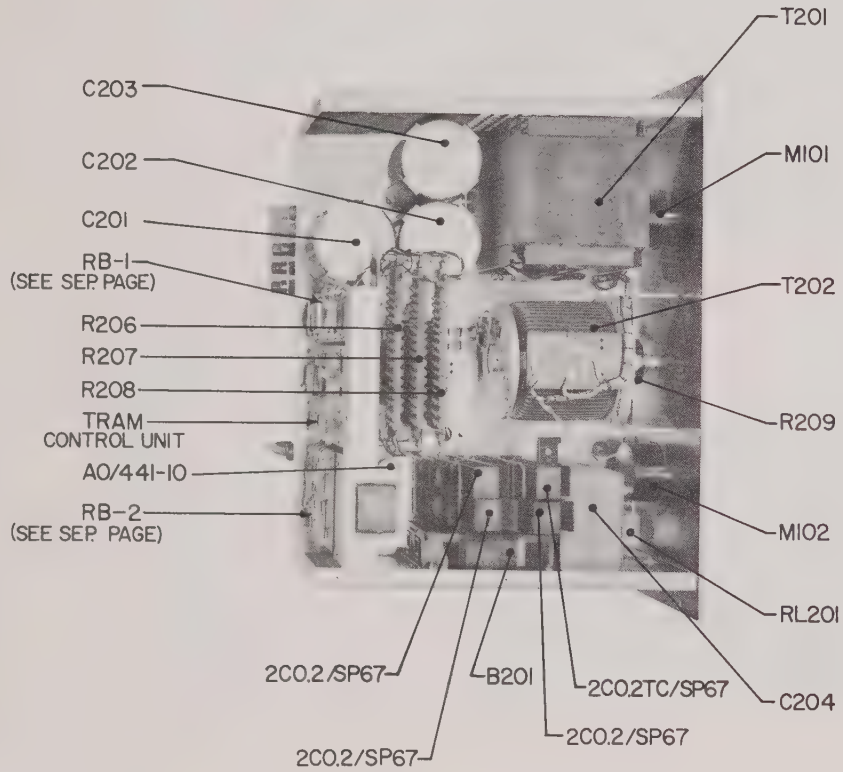
*Note 1- R12 is 800 ohms, Part no. 115-1193 in following Models:
SM 14-7X; SM 14-15X; SM 14-30X; SM 36-5X; SM 36-10X; SM 36-15X

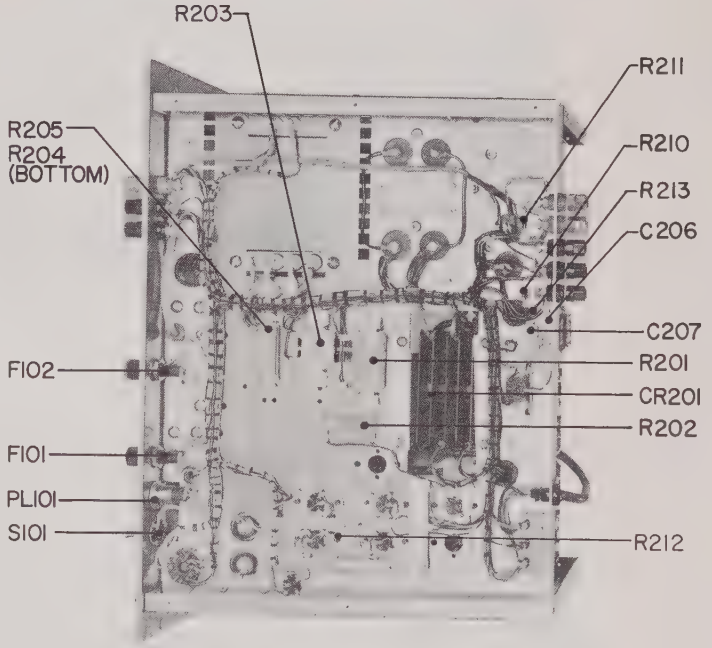
*Note 2- R12 is 700 ohms, Part no. 115-1194 in following Models:
SM 75-2X; SM 75-5X; SM 75-8X; SM 160-1X; SM 160-2X; SM 160-4X

*Note 3 - R12 is 900 ohms, Part no. 115-1195 in following Models:
SM 325-0.5X; SM 325-1X; SM 325-2X

REPLACEMENT PARTS MAY BE ORDERED FROM KEPCO, INC. ORDERS SHOULD INCLUDE KEPCO PART NUMBER AND DESCRIPTION.

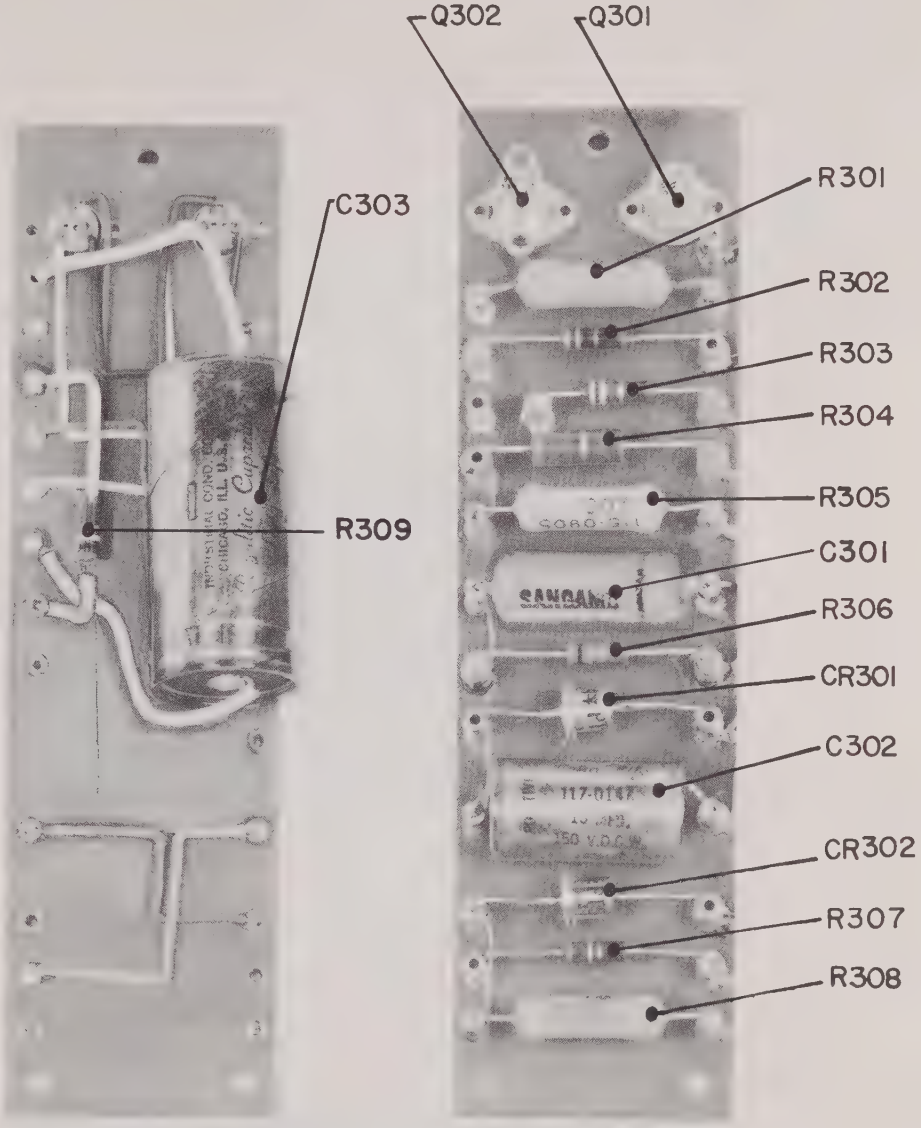
PLEASE NOTE: THE MANUFACTURER'S NAME AND PART NUMBER LISTED FOR EACH ITEM ON REPLACEMENT PARTS LISTS, REPRESENTS AT LEAST ONE SOURCE FOR THAT ITEM AND IS LISTED SOLELY FOR THE CONVENIENCE OF KEPCO EQUIPMENT OWNERS IN OBTAINING REPLACEMENT PARTS LOCALLY. WE RESERVE THE RIGHT TO USE EQUIVALENT ITEMS FROM ALTERNATE SOURCES. KEPCO, INC.



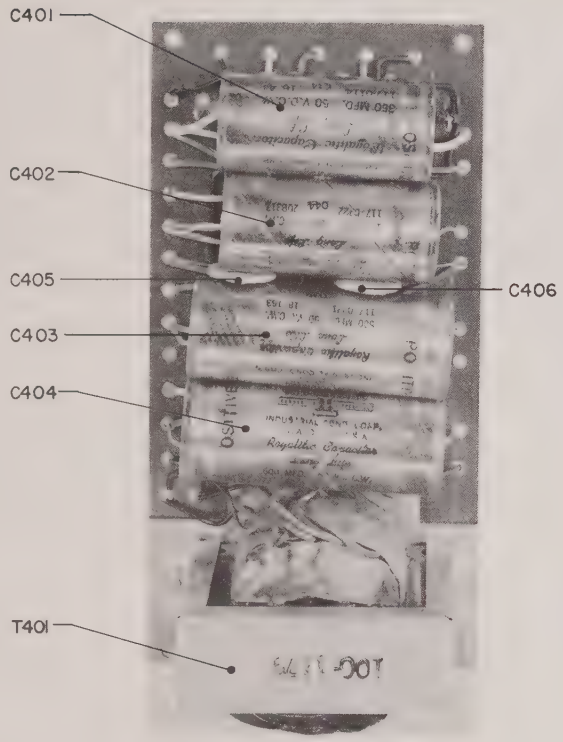

CORRECTIONS, IF ANY, APPEAR ON SHEET ATTACHED TO REAR COVER

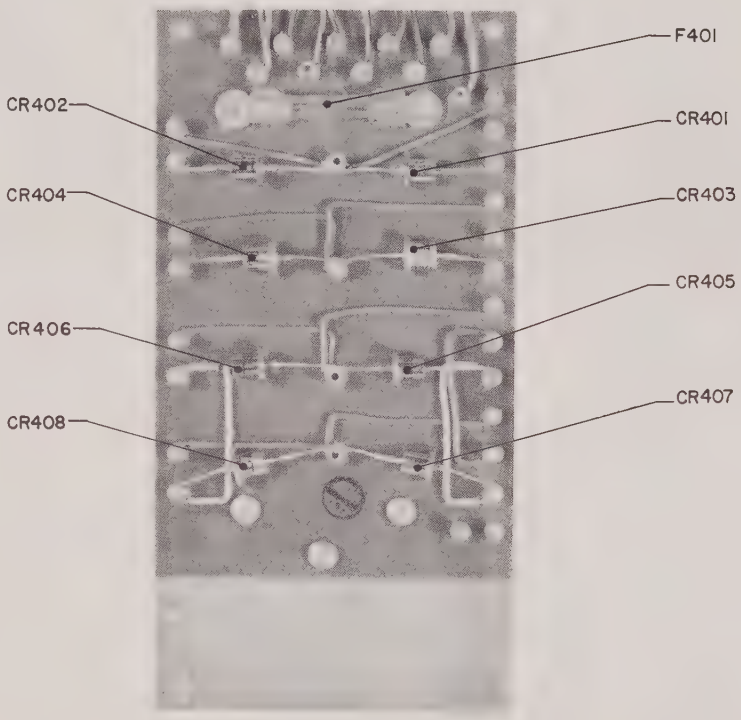
| KEPCO INC. | |
|---|---|
| FLUSHING NEW YORK | |
| ITEM POWER UNIT | DES 6-16-61 |
| | APPD J.P.K. |
| MODEL SM-36-15 | DFTM M.CEA |
| DWG. No CM00927 | CHKD T. Del |




| KEPCO INC. | |
|---|---|
| FLUSHING NEW YORK | |
| ITEM RB-1 | DES. 6-16-61 |
| | APPD G. Eganes |
| MODEL SM-36-15 | DFTM M. CEA |
| DWG. No. AM00910 | CHKD T Dal |

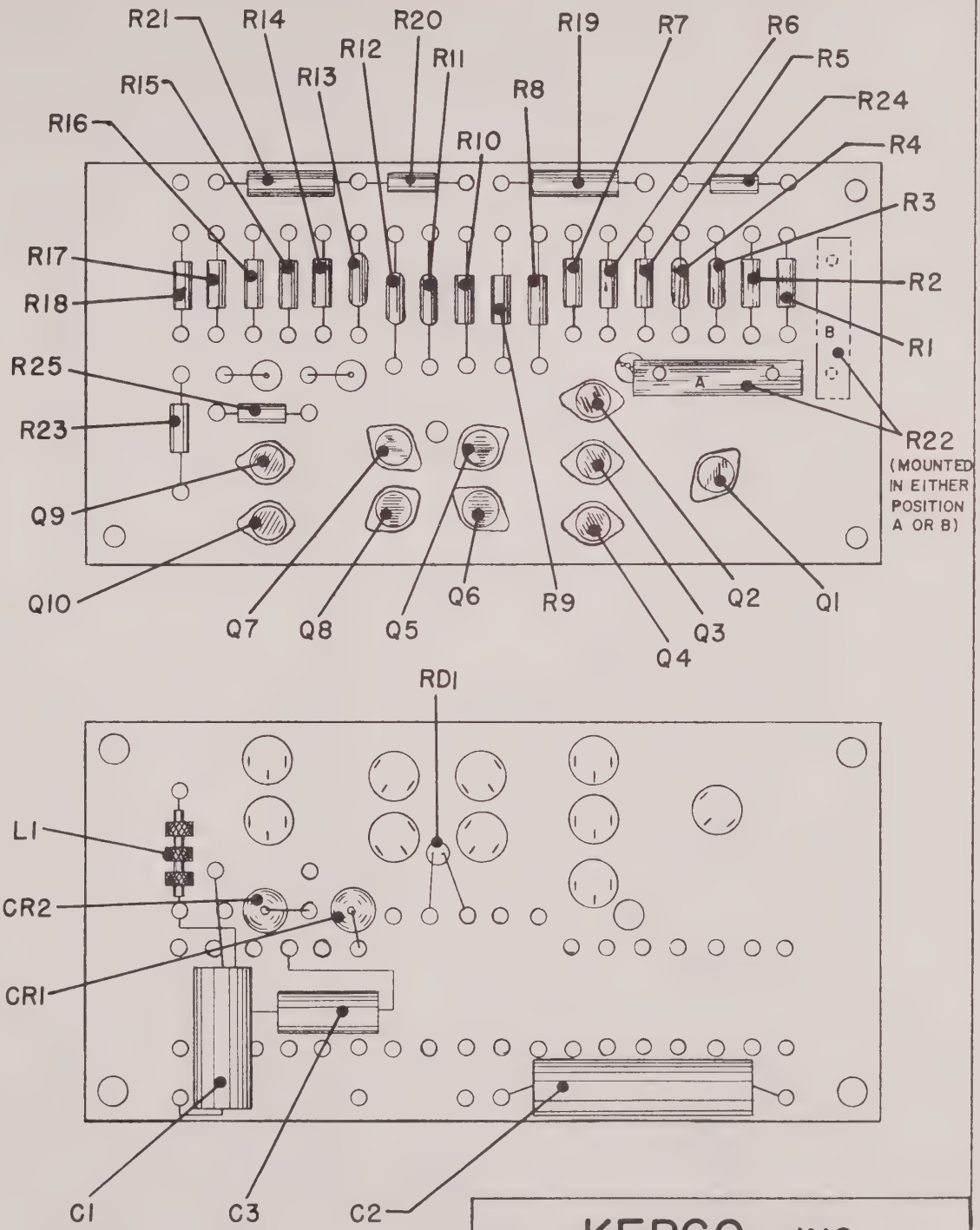
CORRECTIONS, IF ANY, APPEAR ON SHEET ATTACHED TO REAR COVER



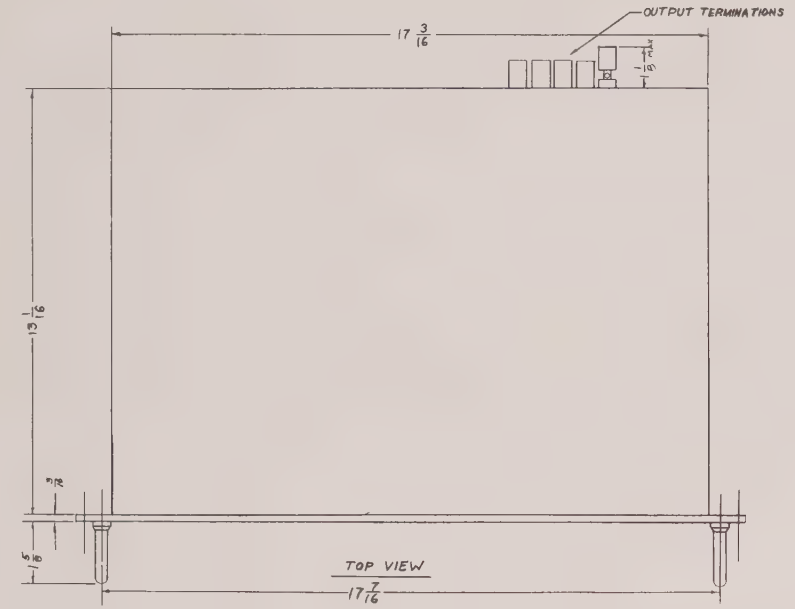




CORRECTIONS, IF ANY, APPEAR ON SHEET ATTACHED TO REAR COVER

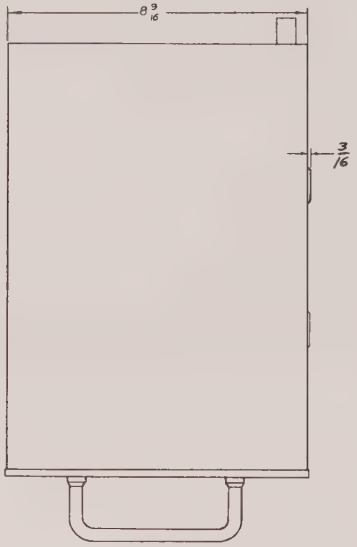
| KEPCO INC. | |
|---|---|
| FLUSHING NEW YORK | |
| ITEM RB-2 | DES. 1-3-61 |
| | APPD |
| MODEL SM—— SERIES | DFTM M.CEA |
| DWG. No. BM00923 | CHKD |



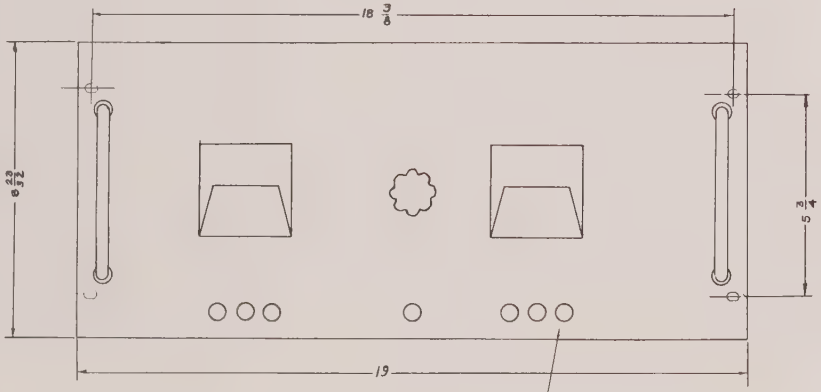

| KEPCO INC. | |
|---|---|
| FLUSHING NEW YORK | |
| ITEM<br>CONTROL UNIT | DES. 12-6-61<br>APPD |
| MODEL TRAM 31 | DFTM M. RAYNER |
| DWG. No AM01809 | CHKD |




TOP VIEW




SIDE VIEW




FRONT VIEW

NOTE:
USED ON MODELS:

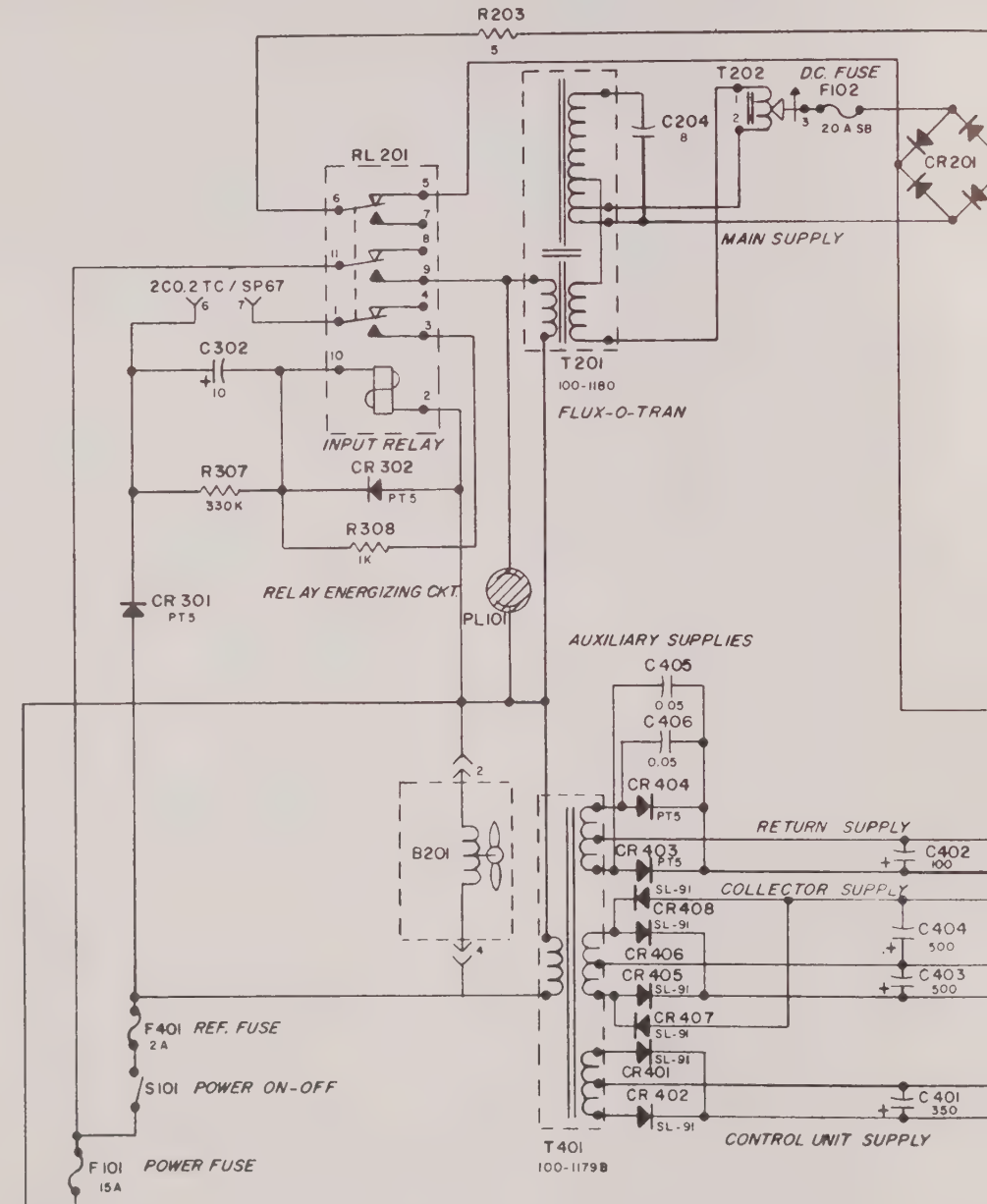
SM-36-15
SM-75-8
SM-160-4
SM 325-2

| | | | |
|---|---|---|---|
| KEPCO INC. FLUSHING, N.Y. | | | |
| TITLE: OUTLINE DRAWING | | | |
| DRAWN: TV | CHECKED: [illegible] | APPROVED: [illegible] | DATE: 4-1-64 |
| MODEL NO: SM-8-3/4 SERIES | | PART NO: | SCALE: 1/4" = |
| DWG. NO. C M00593 | | | 2 |

TOLERANCE UNLESS OTHERWISE SPECIFIED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2°

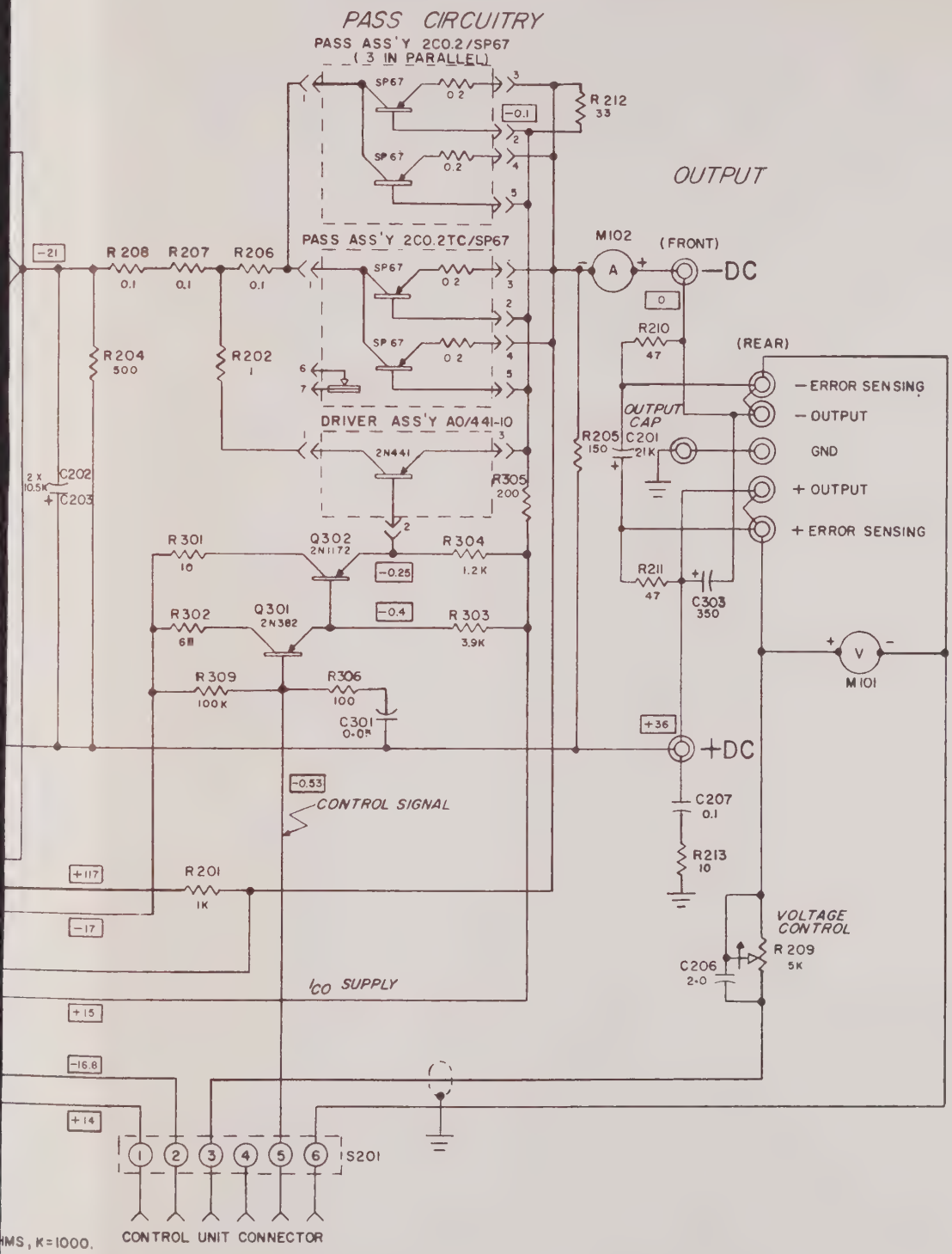
INPUT CONTROL

DC SOURCES



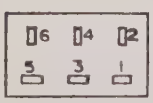

NOTE:

1. T202 GANGED TO R209.
2. ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS, RESISTOR VALUES IN O
3. ALL VOLTAGE READINGS TAKEN WITH 20,000 Ω/VOLT METER, WITH REFERE
   MINUS OUTPUT TERMINALS, UNDER THE FOLLOWING CONDITIONS:
   A. LINE = 115 V.A.C.
   B. D.C. OUTPUT = 36 VOLTS.
   C. OUTPUT CURRENT = ZERO.
4. VOLTAGES ARE TYPICAL AND ARE SUBJECT TO NORMAL COMPONENT TOL
5. METERS M101, M102 APPLY ONLY TO SM-36 -15 M AND SM-36 -15MX M
6. ORDER REPLACEMENT PARTS BY KEPCO PART NUMBER
   PROVIDED IN PARTS LIST SECTION.




HMS, K=1000.
CE TO

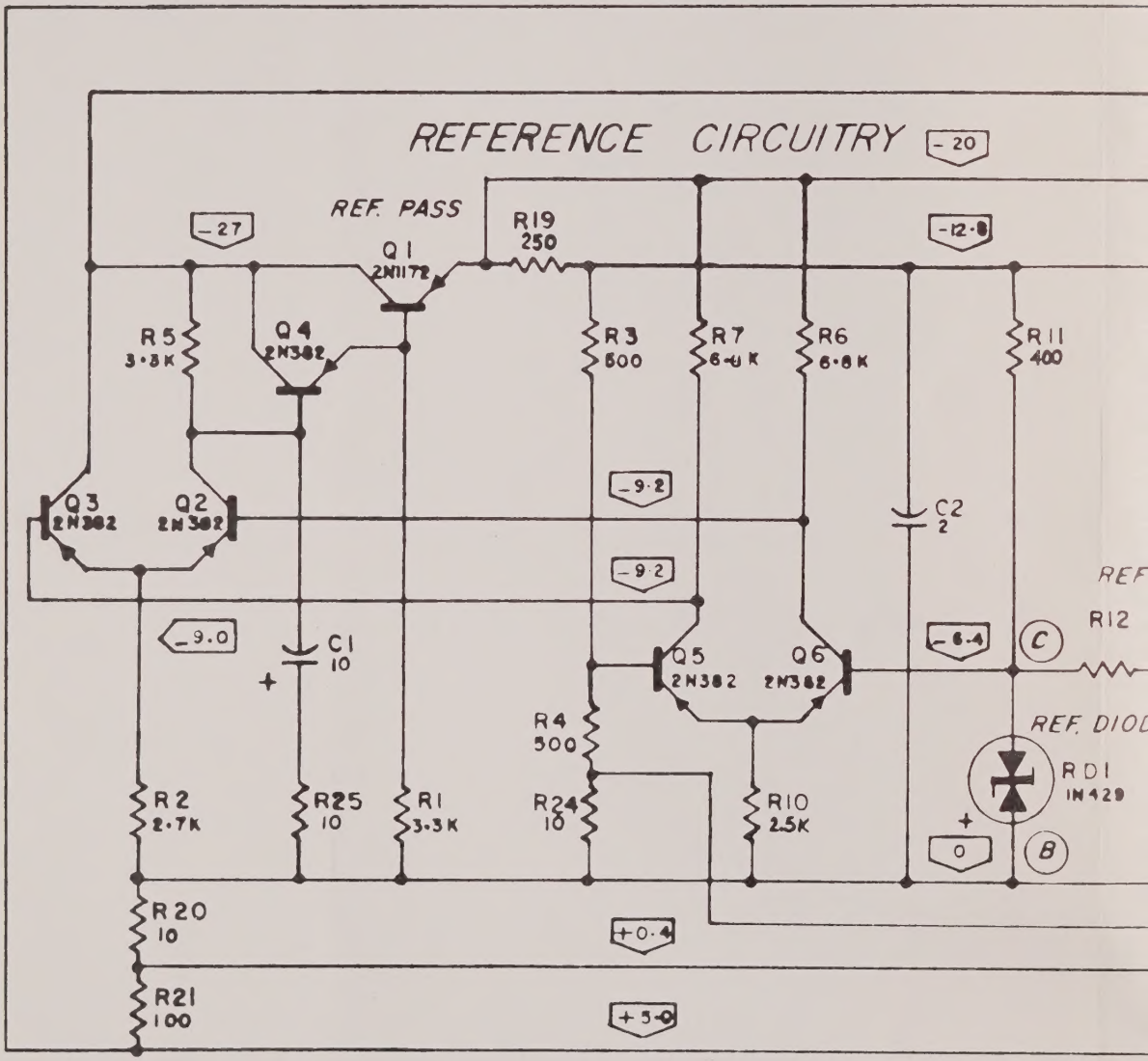
RANCE.
ODELS.




CONTROL UNIT CONNECTOR
SOCKET (WIRING SIDE)

See Correction Sheet On Inside Back Cover.

| KEPCO LABORATORIES | | |
|---|---|---|
| FLUSHING | | NEW YORK |
| ITEM: POWER UNIT | DES J.R.G. | |
| | APPD 10-24-61 | |
| MODEL SM-36-15M | DFTM Z.O.K. | |
| DWG. No C-M00293 | CHKD J.P.K. | |



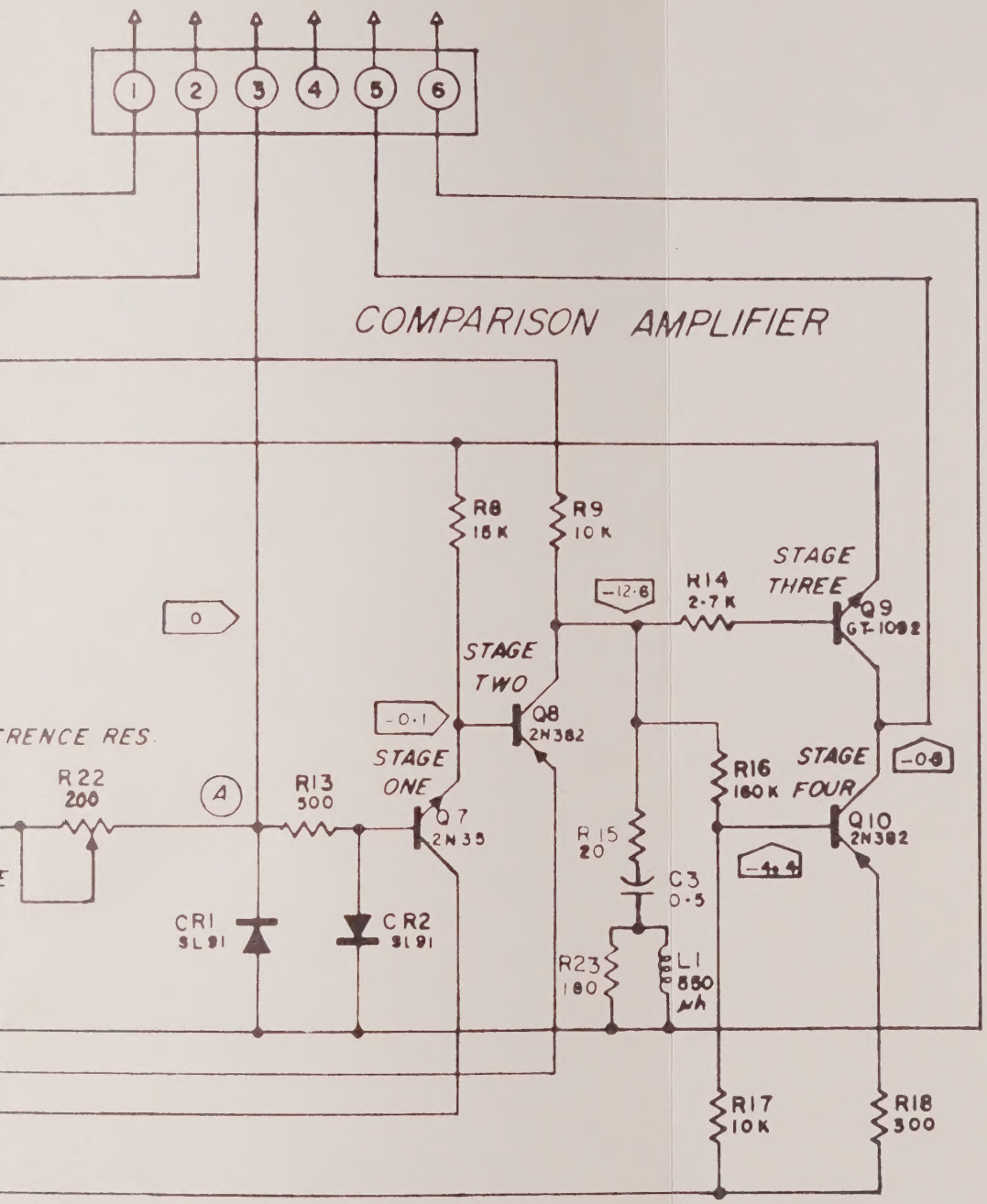

NOTE :

1. ALL VOLTAGES TAKEN UNDER CONDITIONS SPECIFIED ON MAIN SCHEMATIC.
2. ORDER REPLACEMENT PARTS BY KEPCO PART NUMBER PROVIDED IN PARTS LISTS SECTION.

(*) MODELS: SM14-7X; SM14-15X; SM14-30X; SM36-10X; SM36-5X; SM36-15

(**) MODELS: SM75-2X; SM75-5X; SM75-8X; SM160-2X; SM160-1X; SM160

(***) MODELS: SM325-1X; SM325-2X




| KEPCO PART NO. | |
|---|---|
| MODEL TRAM 31 | |
| SEE KEPCO PARTS LIST | |
| FOR COMPLETE DESCRIP | |
| C1 | 117-0136 |
| C2 | 117-0129 |
| C3 | 117-0123 |
| CR1 | 124-0084 |
| CR2 | 124-0084 |
| L1 | 176-0046 |
| Q1 | 119-0034 |
| Q2 | 119-0022 |
| Q3 | 119-0022 |
| Q4 | 119-0022 |
| Q5 | 119-0022 |
| Q6 | 119-0022 |
| Q7 | 119-0007 |
| Q8 | 119-0022 |
| Q9 | 119-0007 |
| Q10 | 119-0022 |
| R1 | 115-0452 |
| R2 | 115-0560 |
| R3 | 115-1192 |
| R4 | 115-1192 |
| R5 | 115-0452 |
| R6 | 115-0579 |
| R7 | 115-0579 |
| R8 | 115-0646 |
| R9 | 115-1162 |
| R10 | 115-0469 |
| R11 | 115-1191 |
| R12(*) | 115-1193 |
| R12(**) | 115-1194 |
| R12(***) | 115-1195 |
| R13 | 115-0938 |
| R14 | 115-0560 |
| R15 | 115-0508 |
| R16 | 115-1024 |
| R17 | 115-0249 |
| R18 | 115-0783 |
| R19 | 115-1161 |
| R20 | 115-1160 |
| R21 | 115-0902 |
| R22 | 115-0863 |
| R23 | 115-0807 |
| R24 | 115-1160 |
| R25 | 115-0818 |
| RD1 | 121-0001 |

KEPCO INC.
FLUSHING, N.Y.

| TITLE | | | |
|---|---|---|---|
| CONTROL UNIT | | | |
| DRAWN C. A. | CHECKED T.P.K. | APPROVED A. [illegible] | DATE 4-20-62 |
| MODEL NO. TRAM - 31 | | PART NO. | SCALE |
| DWG. NO. B M00 629 | | | 4 |

-4X; SM325-0.5X

## INSTRUCTION MANUAL CORRECTION

Please note the following changes to the Manual material as indicated:

Power Unit, Schematic Diagram and Parts List:

1. (c513)Change Resistor R203 from 5 ohms,30 w, to: Resistor, Fixed, Power, Strip, 15 ohms, 30 w; Hardwick Hindle B552; Kepco #115-1173.

## INSTRUCTION MANUAL CORRECTION

Please note the following changes to the Manual material as indicated:

Power Unit, Parts List and Schematic:

1. The two resistors, 47 ohms, 1/2 watt each, connected one from each Output terminal to its respective Error Sensing terminal, have been changed to: Resistor, Fixed, Power, Axial, 50 ohms, 5 w, 5%; Ward Leonard 3X50; Kepco #115-0641.

2. Silicon Diode CR 302 (PT-5) has been replaced by a resistor R 320; Resistor, Fixed, Axial, 2500 ohms, 3 w, 5%; Kepco #115-0469; Ward Leonard #3X2500.

SM/7-1862

131-38 SANFORD AVENUE • FLUSHING 52, N. Y. • Area Code 212 IN 1-7000 • TWX # NY 4-5196

146-0045 - 1/62 -12M